



A.D. 1854 N° 2555.

Dynamic Electricity.

LETTERS PATENT to Cromwell Fleetwood Varley, of No. 1, Charles Street, Somers Town, St. Pancras, Middlesex, for the Invention of "**IMPROVEMENTS IN PRODUCING AND APPLYING DYNAMIC ELECTRICITY.**"

Sealed the 18th May 1855, and dated the 5th December 1854.

PROVISIONAL SPECIFICATION left by the said Cromwell Fleetwood Varley at the Office of the Commissioners of Patents, with his Petition, on the 5th December 1854.

I, CROMWELL FLEETWOOD VARLEY, of No. 1, Charles Street, Somers Town, 5 St. Pancras, Middlesex, do hereby declare the nature of the said Invention for "**IMPROVEMENTS IN PRODUCING AND APPLYING DYNAMIC ELECTRICITY**" to be as follows:—

My improvements consist in making batteries whose actions are similar to that of the Daniel's battery, but which prevent to a very great extent the deposition of metallic copper (or other negative metals) on the positive metal (usually zinc). Daniel's batteries after long use are liable to fail, from the zinc becoming coated with metallic copper, & so opposing a copper instead of a zinc surface to the copper, thus neutralizing its action. They also fail from metallic copper becoming deposited on the porous cells & in the pores 15 of the said cells, establishing "local action," reducing the intensity, & causing great waste of metals & solutions. I get over these defects in the following

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ways:—1st, by dispensing with the porous cells, the positive metals or elements being placed above the negative: the two solutions are kept separate by difference of gravity, and the latter operation is sometimes assisted by placing above the negative metal & its solution or crystals, pieces of cloth, sand, clay, or any substance which has no chemical action on the solution, but tends to 5 maintain them separate. The positive element is so placed as to clean itself by the action of the battery.

2nd, I effect a similar object by using more than one porous division, and placing between the negative & positive metals (or elements) & solutions other metals or solutions, or both, which intercept by decomposition the passage 10 of one solution to the other.

3rd, I sometimes use negative salts of difficult solubility with the negative elements.

The last improvement consists in applying to the poles of the battery a series of induction surfaces to store up the power, and so make a small battery 15 answer the purposes of a larger one. Batteries with all the above improvements are peculiarly adapted for telegraphs from their constancy and economy.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Cromwell Fleetwood Varley in the Great Seal Patent Office on the 4th June 1855. 20

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, CROMWELL FLEETWOOD VARLEY, of No. 1, Charles Street, Somers Town, St. Pancras, Middlesex, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fifth day of December, in the year of our Lord 25 One thousand eight hundred and fifty-four, in the eighteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Cromwell Fleetwood Varley, Her special licence that I, the said Cromwell Fleetwood Varley, my executors, administrators, and assigns, or such others as I, the said Cromwell Fleetwood Varley, my executors, administrators, and 30 assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN PRODUCING & APPLYING DYNAMIC ELECTRICITY," upon the con- 35 dition (amongst others) that I, the said Cromwell Fleetwood Varley, shall, by

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an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the
5 said Letters Patent.

NOW KNOW YE, that I, the said Cromwell Fleetwood Varley, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

10 My improvement consists in making batteries charged with two or more neutral metallic salts, the electrical power of which is generated in a manner similar to that of the Daniel's battery, while the deposition of the metal from the negative salt on the positive element of the Daniel's battery, which reduces the intensity of the electrical currents generated, & which will often stop the
15 action almost entirely, is by my arrangement prevented. Daniel's batteries after long use fail, from the zinc becoming coated with metallic copper, also from copper being deposited on & in the pores of the porous cells, causing local action, & so reducing the intensity & occasioning much wast of metal, solutions, & porous cells. I avoid these defects, first, by placing the positive
20 metal or elements above the negatives, as in Fig. 1, without porous cells, & using two solutions which keep separate by difference of gravity, & this is assisted in some cases by placing above the negative metal & its solution & crystals, layers of cloth, sand, clay, or any substance that does not act chemically on the solutions, but tends to retain them separate.

25 The reason for making the zinc conical & placing it over the negative element is, that as often as the negative salt shall rise up to & deposit its metal on the zinc, the deposited metal shall fall away, because the zinc is continually being dissolved whilst the battery is in action, & the hold which the deposited metal had to it is as constantly removed, thus letting it fall
30 to the bottom, where it does no harm.

Second, I effect a similar object by using more than one porous division, as Fig. 2, & placing between the negative & positive elements & solutions other metals or solutions, or both, so as to intercept by decomposition the passage of the one solution to the other, but I prefer the interposition of
35 metallic zinc in a solution of itself.

Third, I frequently use negative salts of difficult solubility, sulphates, or chlorides of lead or mercury, such batteries being very constant. By using salts of difficult solubility their tendency to rise & collect on the cone of zinc (Z) is very much reduced ; the nearly insoluble salts of lead or mercury are

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preferable, the latter where a very constant current is required. I then use a cylinder of pure zinc amalgamated, & nearly of the same diameter as the parallel-sided glass vessel in which it is placed, as Fig. 3; enough mercury to cover the bottom is put in, this being the negative element; on it is placed a quantity of sulphate or other salt of mercury, but not enough to be in 5 contact with the zinc; then the vessel is fill'd with a solution of zinc in the same acid as the mercurial salt, & over it is placed a film of oil to prevent evaporation. This battery is very regular in its action; 1st, because so fast as the distance wou'd be increased by the dissolution of the zinc, so fast will the surface of the mercury rise by the decomposition of its salt, & so preserve 10 almost the same distance, particularly if the surface of zinc is well proportioned to the surface of mercury, because, equal surfaces being always presented, the same distance between them is maintain'd. 2d, mercury being a liquid, it does not like other metals grow into leaves amongst the insoluble salt, but always presents an equal surface; yet, shou'd any mercurial salt 15 rise & touch the zinc it wou'd be decomposed, & only amalgamate the zinc a little more, which, as is well known, does not alter its electrical condition. But by using a nearly or quite insoluble salt, this local decomposition is almost, if not entirely, prevented. A single or double porous cell, or stratum of cloth, sand, or clay, as described in Figs. 1 & 2, may be added to this if 20 desirable, shou'd the battery be subjected to motion or agitation. This battery gives a constant & equal current, no matter how long so ever it has been in action, provided there remain any zinc & salt of mercury. By putting sufficient zinc & salt of mercury at the outset, the battery may be kept in action for an almost indefinite period. Note, the zinc shou'd be supported by a 25 piece of iron or platina cast in it, that the support may not be destroyed by amalgamation, & the iron or platina wire used to connect the mercury is coated with gutta percha all but the part inserted in the mercury.

Fourthly, I apply to the poles of the battery a series of induction surfaces, as Fig. 4, to store up the power, & so make a small battery answer the pur- 30 pose of a large one, & also to act as a measure when telegraphing through long submarine or subterranean lines.

DESCRIPTION OF THE DRAWINGS.

Fig. 1, *a, a*, a glass or other vessel; *Z*, a conical mass of zinc; *c, c*, plate copper, extending over the bottom & about two-thirds up the sides; *b, b*, 35 crystals of negative salt; *d, d*, layer of cloth, sand, or other similar material; *e, e*, solution of zinc, in generally the same acid as the negative salt.

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Fig. 2, *a, a*, a glass vessel; *c, c*, copper or other negative lining; the glass may be dispensed with by using a copper vessel. *Z*, a mass or cylinder of zinc in the central porous cell *f*; *g*, the outer porous cell, in which between the two cells is placed a cylinder of perforated zinc *h*, or pieces of zinc to decom-
 5 pose any of the negative salt, which otherwise might pass through from the exterior to the interior; this may be effected also by an alkaline solution.

Fig. 3, *a, a*, the glass or other vessel; *Z*, the cylindrical mass of pure zinc amalgamated; *M*, the mercury; *i, i*, salt of mercury; *j, j*, solution of zinc; *k*, the iron platina or other wire, cover'd with gutta percha except where it
 10 enters the mercury; *l, l*, surface of oil.

Fig. 4, an end view of a series of induction plates which are to be laid close to each other, but here they are separated to shew them; a pile of these form a Leyden battery; they may be put together in various ways.

Figs. 5, 6, 7, 8, on a smaller scale, shews the form of the layers for one
 15 mode of construction. Figs. 5 & 6 are sheets of tin or other metallic foil; & Fig. 7, a sheet of oil'd silk, gutta percha, or other non-conducting substance; half of the sheets for one pole are like Fig. 5, having the left corner cut away; the other sheets for the other pole are like Fig. 6, with the right corners cut off; & the non-conducting sheets which are to go between
 20 are larger than the others, & like Fig. 7, have two corners cut away. A box of suitable size for a pile like Fig. 4 has a sheet of foil 1 (like Fig. 5) laid at bottom; on this is put a non-conducting sheet, like Fig. 7, & on that foil 2 (like Fig. 6), then a non-conductor (as Fig. 7), then foil 3 & a non-conductor, then foil 4, & so on, till a battery of sufficient capacity is made
 25 up. By this means, all the sheets like Fig. 5, as 1, 3, 5, 7, 9, Fig. 4, will have a corner overhanging the gaps *a* of Fig. 7, & all the intermediate sheets of foil, as 2, 4, 6, 8, 10, like Fig. 6, will overhang the gaps *b*, then all the corners *a* will be pressed together to join those sheets for one pole, & the corners *b* will be pressed together to form the other pole of the battery, and
 30 these two poles are to be join'd to the galvanic battery poles.

Fig. 8, one sheet of tin foil on the gutta percha, which being larger every way prevents the opposite foils touching each other.

These induction plates serve to store up electricity when the battery is at rest, one series of plates being in contact with the positive pole & the other
 35 intermediate series with the negative pole of the battery.

The chief use of this is to measure out, as it were, a given quantity of electricity for underground lines, so that the wire shall not be more charged by contact with the battery of long duration than by a momentary contact; this reservoir serving to charge the wire to the right degree at once, &, in

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conjunction with my apparatus previously patented, enables me to work to very great distances through submarine cables & subterranean wires. These constant batteries & induction plates are very serviceable for electric illumination where great constancy is required. By aid of the induction plates, the carbon is much more suddenly & vividly ignited; the momentary discharge being very 5 intense, the light is consequently much more regular.

CLAIMS.

1st, the use of a positive metal of a conical, sugar loaf, or similar form, placed over the negative metal, so that by its form any negative metal deposited thereon shall fall off by the action of gravity. 10

2d, the use of two or more porous divisions, with a solution or metal, or both, between them, to decompose any negative salt that might otherwise pass to the positive element.

3d, the combination described in Fig. 3, which gives as nearly as possible a continuous & equal current. 15

4th, the use of induction plates with battery for telegraphic & electric light purposes.

In witness whereof, I, the said Cromwell Fleetwood Varley, have hereunto set my hand & seal, this Fourth day of June, A.D. 1855.

CROMWELL FLEETWOOD VARLEY. 20

(L.S.)

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